TECHNICAL MEMORANDUM

(TM Series)

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General Purpose Satellite Computer Program
Description Milestone 11
Program Routine to Prepare Flight Support
Data Package Tapes (SPDPT)
25 March 1963

by

G. D. West

Approved

J. P. Wong

SYSTEM DEVELOPMENT CORPORATION
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IDENTIFICATION

A. Title: Program Routine to Prepare Flight Support Data Package Tapes (SPDPT), J98 Mod AA

B. Programmer: G. D. West

C. Contractor: System Development Corporation

PURPOSE

SPDPT is a program routine to prepare flight support data package tapes for vehicles which carry programmable orbital timers.

USAGE

The program SPDPT is coded for the CDC 1604 and is compatible with the current CPDC operating procedures.

A. Program Input Requirements

The following input data are required by the program SPDPT:

1. The OSE tape, a 1604-compatible magnetic tape describing the orbital sequence of events for the vehicle; (Appendix A specifies the tape format);
2. The OPCODE deck, a deck of cards defining the data package timer table entry, if any, required for each timer event given on the OSE tape; (Appendix B specifies the card format);
3. The parameter deck, a card deck of vehicle-specific values for all data package parameters except the orbital timer table; (the format is determined by the requirements of the flight support programs which read the data package tape).

B. Output Description

SPDPT provides the user with two copies of the data package tape, an on-line listing of the data package and a few comments regarding the progress of program operation.

The tape format is the MTCII standard card image with look-ahead (11 words). Except for the timer table, the card images are copied directly from the parameter deck. The timer table contains a BCD card image for each programmed timer event. The format of the card image is as follows:

Equivalent Card Columns	Item	Description
1-3	"SPC"	Timer table tag
4-7	Sequence #	Integer (1-9999), left justified
10-12	"BCD"	Indicates pseudo operation
20	2	Indicates 2 BCD words follow
21-28	timer event code	Three character operation identification, auxiliary information as required, on-off indicator
29-36	tape time	Fortran format F8.0

The on-line comments with regard to program operation are as follows:

"IRREMEDIAL TAPE ERROR __X__" where X represents A, B, or C, indicates that a redundancy error has occurred on the denoted tape and program operation cannot be continued.

"ILLEGAL OP CODE ENCOUNTERED....." indicates that the routine has encountered an operation code on the OSE tape that has not been defined by the OPCODE card deck. The program then prints the OSE tape record containing the illegal operation code and proceeds to process subsequent OSE tape records.

"AN ORDERING ERROR HAS BEEN FOUND....." indicates that a tape time, t_i for which $t_i < t_{i-1}$, has been encountered. The offending timer table entry is then printed on-line.

"START DATA LISTING" indicates that the program has prepared a data package tape and will now copy the tape and print the tape contents on-line.

"FINISHED. SAVE TAPES, LISTINGS AND INPUT CARDS" indicates the successful completion of program operation.

C. Program Operating Instructions

The program operates in the COPII System. Set-up is as follows:

Card Reader:	Program deck followed by the OPCODE deck and the parameter deck; (refer to Appendix C for a description of the card deck format);
1612 Printer:	Paper
Tape Unit #1:	System tape (M-1)
Tape Unit #3:	System Scratch (blank, with write ring)
Tape Unit #4:	Tape A (Blank, with write ring)
Tape Unit #5:	Tape B (OSE tape), file protect
Tape Unit #6:	Tape C (Blank, with write ring)

Program operation is initiated by loading the system tape. Operator intervention during the course of program operation is not required as no error stops are programmed.

At the completion of program operation, tapes A and C (units 4 and 6) will be the data package tapes. The operator is to reserve tapes A and C and to return tape B and the on-line printer output to the requestor.

METHOD

The data package parameter values other than the orbital timer program table are prepared by a simple transfer of information from punched cards to magnetic tape. The orbital timer program table is prepared by selecting, encoding, formatting and recording information from the OSE tape according to the requirements specified by the OPCODE deck.

The OSE tape defines the orbital timer program. For each programmed timer event the following data are provided:

a. An integer known as the operation code which identifies the event;

b. The tape time at which the event is programmed;

c. The nominal crossing latitude at which the event is programmed, if applicable;

d. The number of the timer subcycle in which the event is programmed.

RESTRICTIONS

The following restrictions apply to program SPDPT:

1. The program name is not pronounceable.
2. In order to re-run the program, it will be necessary to read the binary deck into computer memory again, as no housekeeping operations are performed by the routine.
3. The program will loop indefinitely if a selected tape unit is in a (not ready) status. No message to the operator is provided for such an operator error.
4. The sequence number (Col. 4-7) is limited to four digits.
5. The subcycle number is limited to three digits.

EXECUTION TIME

Three to six minutes can be considered a reasonable range of values for the program execution time. The actual execution time varies according to the size of the parameter deck and the length of the OSE.

STORAGE REQUIREMENTS

The routine requires 463 (octal) memory registers of which 260 (octal) are for program instruction storage.

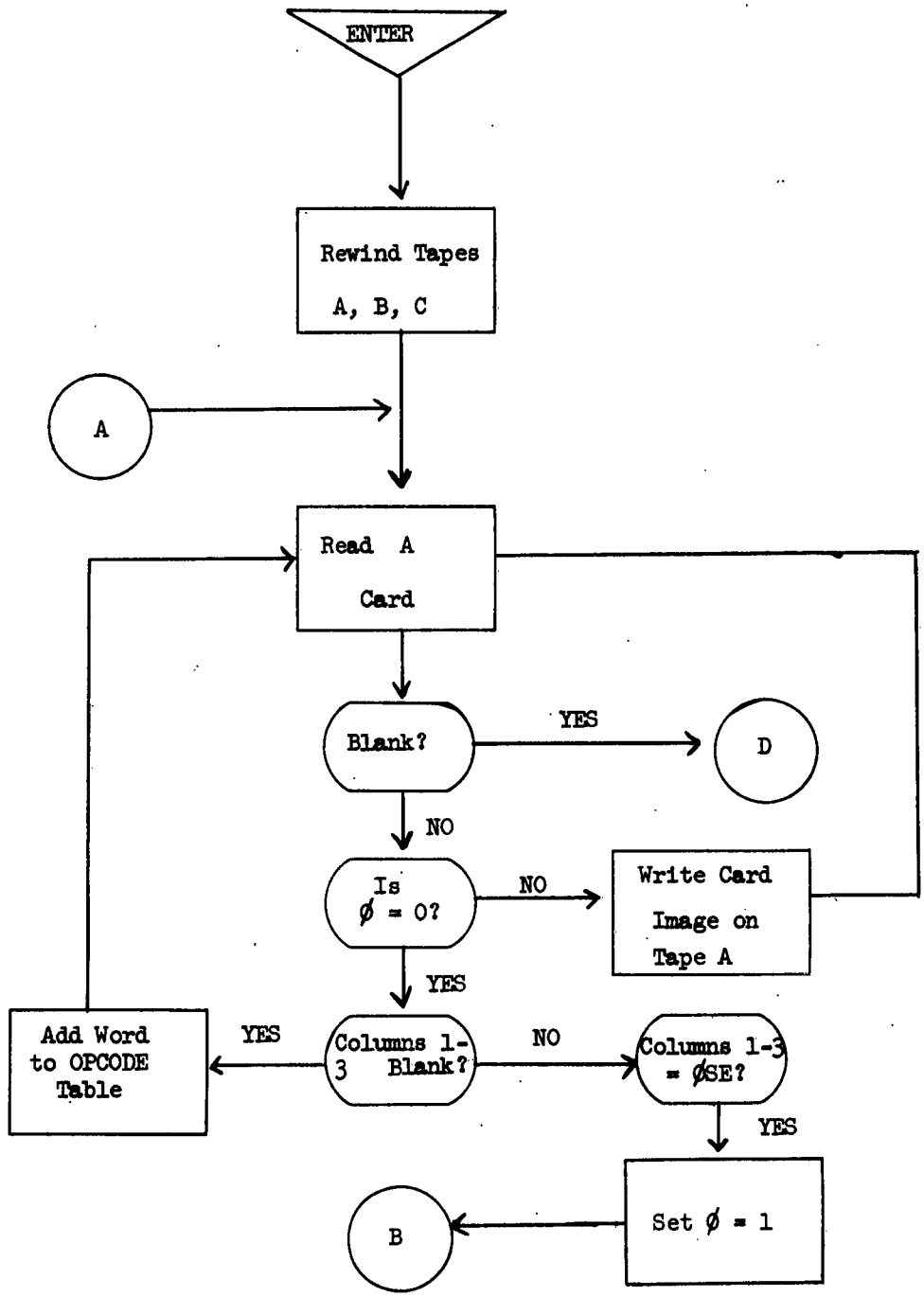
VALIDATION TEST

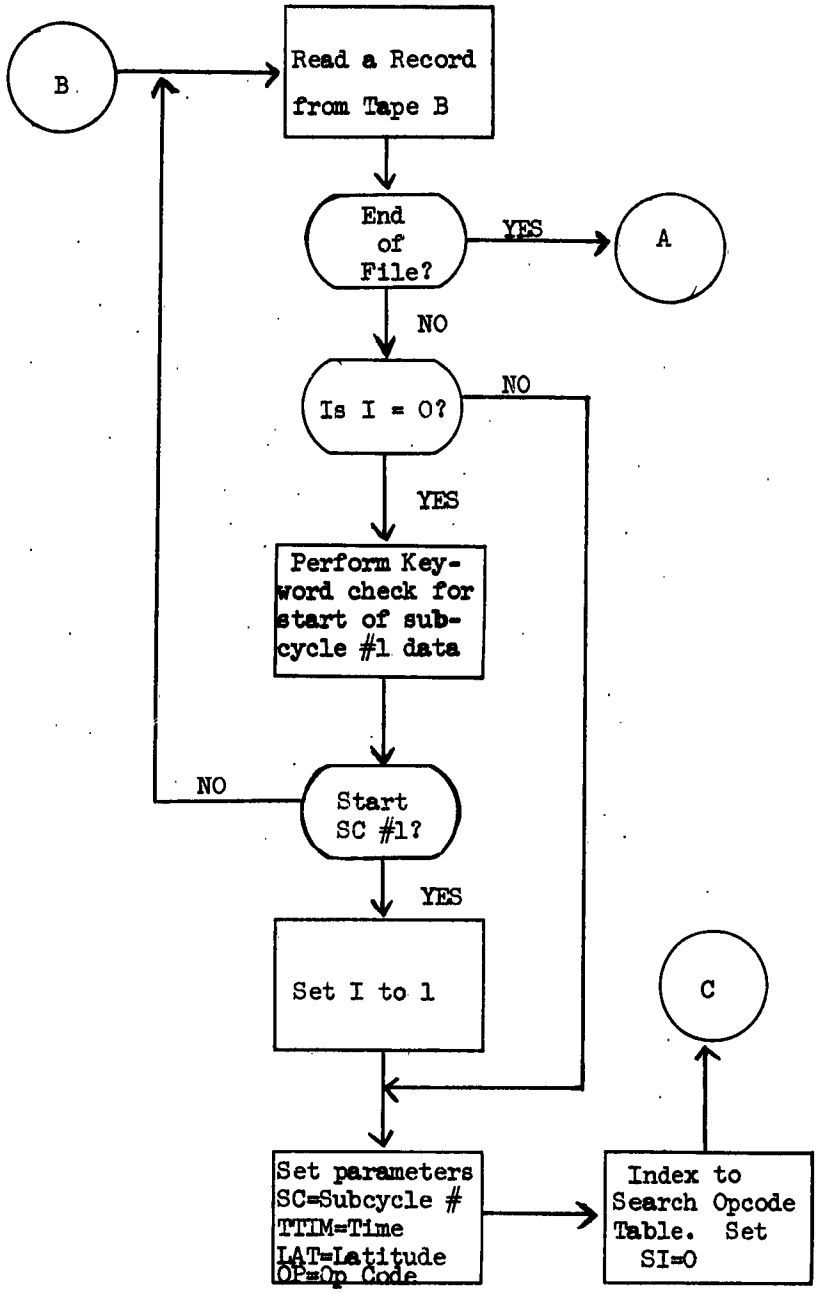
SPDPT was validated by using it to prepare operational data package tapes for several flights for Program 162. These operational data package tapes were listed and the output visually compared to the inputs used; translations between the inputs and outputs were manually made and checked. The operational data package tapes were used by the WNRT and TIME functions to prepare the initial reset tape and to update the Fairchild Timer Tables on subsequent reset tapes. The performance of these reset tapes during four separate flight test operations was totally acceptable, thereby the program SPDPT was validated.

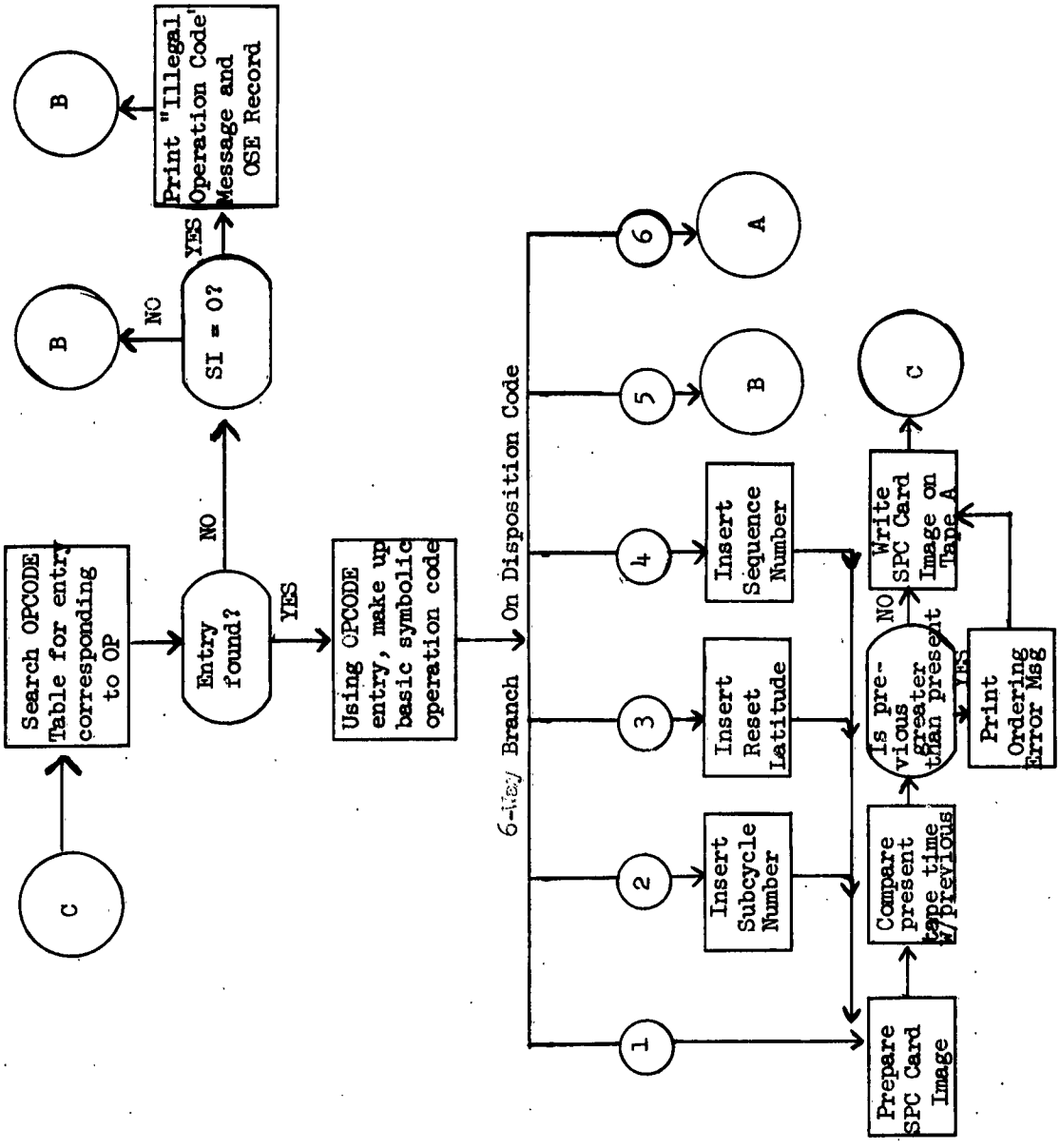
REFERENCES

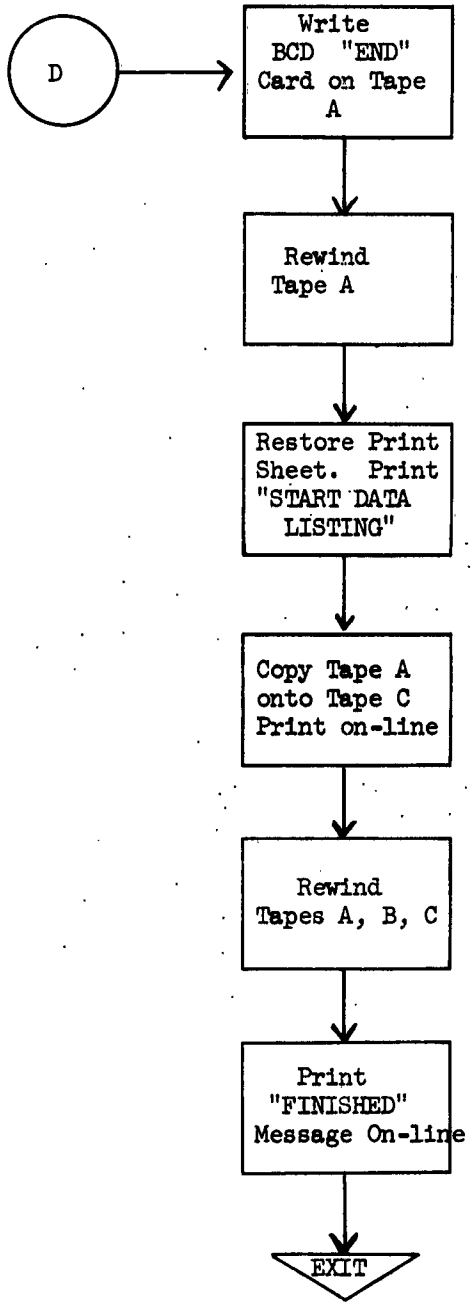
A. Subroutines Required by SPDPT:
   1. MTCII (CPL #75703)
   2. TAPE (CPL #75050)
   3. SPDPT (CPL #75898)

PROGRAM FLOWCHART




B
Read a Record from Tape B
End of File?
YES
A
NO
Is I = 0?
NO
YES
Perform Key-word check for start of sub-cycle #1 data
NO
Start SC #1?
YES
Set I to 1
C
Set parameters SC=Subcycle # TTIM=Time LAT=Latitude OP=Op Code
Index to Search Opcode Table. Set SI=0


C
Search OPCODE Table for entry corresponding to OP
Entry found?
NO
YES
B
SI = 0?
NO
YES
B
Print "Illegal Operation Code" Message and OSE Record
Using OPCODE entry, make up basic symbolic operation code
On Disposition Code 6-way Branch
1
2
3
4
5
6
Insert Subcycle Number
Insert Reset Latitude
Insert Sequence Number
B
A
Prepare SPC Card Image
Compare present tape time w/previous
Is previous greater than present
NO
YES
Write SPC Card Image on Tape A
C
Print Ordering Error Msg


D
Write BCD "END" Card on Tape A
Rewind Tape A
Restore Print Sheet. Print "START DATA LISTING"
Copy Tape A onto Tape C Print on-line
Rewind Tapes A, B, C
Print "FINISHED" Message On-line
EXIT

Appendix A: OSE Tape Format

The OSE tape is a BCD magnetic tape defining the orbital sequence of events. Each record is a card image describing one timer event. The format of the information used by SPDPT is as follows:

Information Item	Equivalent Card Columns	Fortran Format
Subcycle Number	7 - 13	F7.3
Tape Time	17 - 25	F9.0
Latitude	36 - 39	I4
Operation Code	44 - 47	I4

The timer operations prior to the beginning of subcycle #1 are not of interest to SPDPT. A keyword search is made to locate the start of subcycle #1 data. The keyword identification is as follows:

Equivalent card columns 9-16 = 1.000✓✓✓ (✓ indicates blank)

The OSE tape need not have fixed-length records. Generally, it will be prepared by an IBM 7090 data processing system.

Appendix B: Format of the OPCODE Card Deck

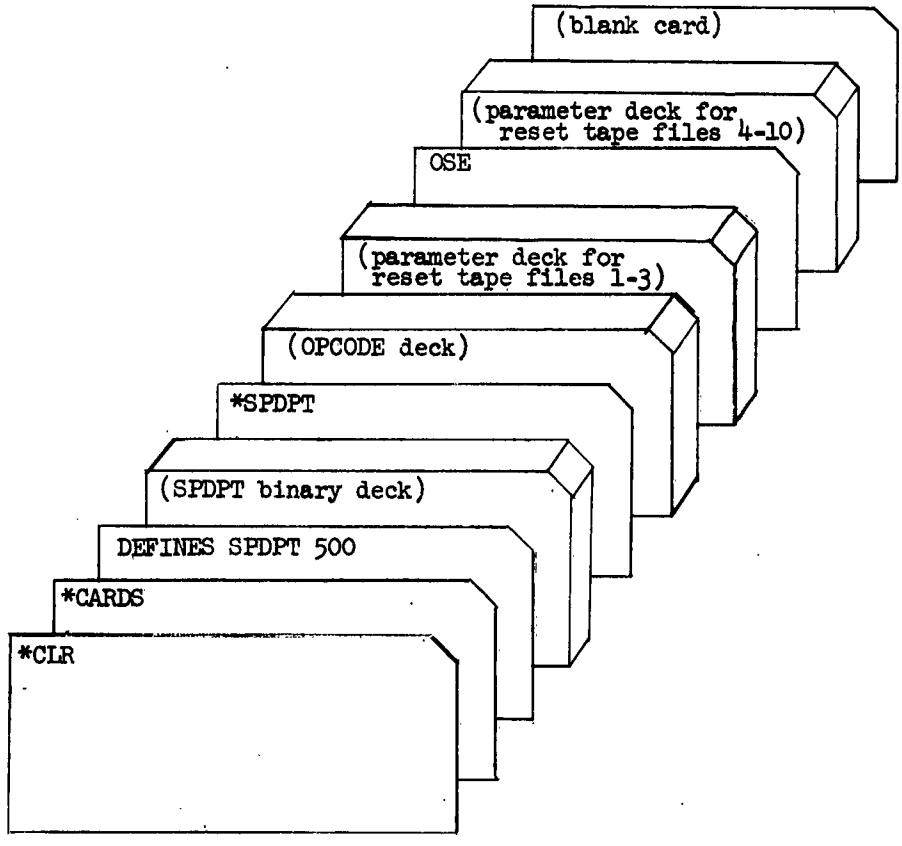
The OPCODE Card Deck specifies the SPDPT program response to the OSE operation codes for programmed timer events. For each OSE operation code there must be an OPCODE card defining the appropriate entry, if any, to be made to the data package timer table .

The format for an OPCODE card is as follows:

Card Columns	Item	Description
1 - 3	Must be blank	
4 - 5	OSE operation code	Integer between 0 and 100, right justified
9 - 11	Timer table event code	3 alpha-numeric characters
12 - 15	Must be blank	
16	On-off indicator	0 for on or not applicable 1 for off
22	Disposition indicator	1 for entry with no auxiliary information 2 for entry with subcycle number 3 for entry with reset latitude 4 for entry with sequence number 5 for no entry (skip) 6 for end of sequence

When two or more entries to the timer table are required for a single OSE operation code, an OPCODE card must be prepared for each entry. The timer table entries will appear in inverse order with respect to the arrangement of the corresponding OPCODE cards in the OPCODE card deck.

Appendix C: The Input Card Deck



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